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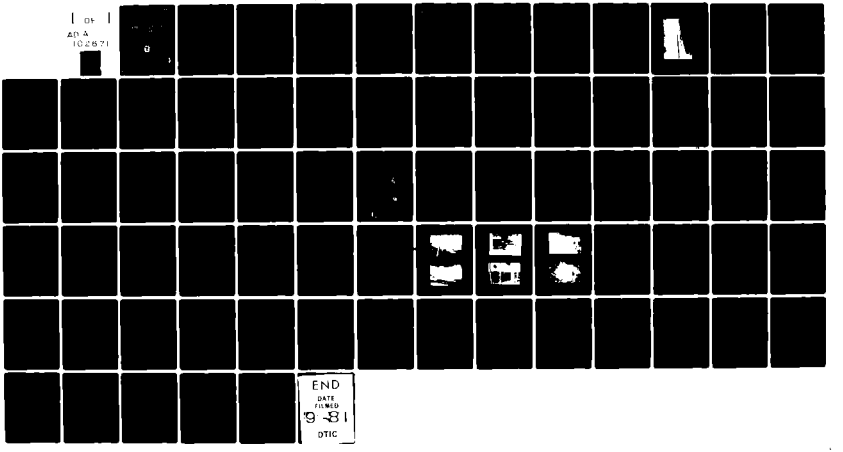

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DELAWARE RIVER BASIN
BIG FLAT BROOK, SUSSEX COUNTY
NEW JERSEY

LAKE OCQUITTUNK
NJ 00260

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

REPT. NO: DAEN/NAP-53842/NJ00260-81/07

JULY 1981

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National Dam Safety Program. Lake Ocquittunk Dam (NJ00260), Delaware River Basin, Big Flat Brook, Sussex County, New Jersey. Phase 1 Inspection Report.

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Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams	National Dam Safety Program	Spillways
Embankments	Lake Ocquittunk Dam, NJ	Erosion
Visual Inspection	Big Flat Brook, NJ	Inlets
Structural Analysis	Delaware River Basin	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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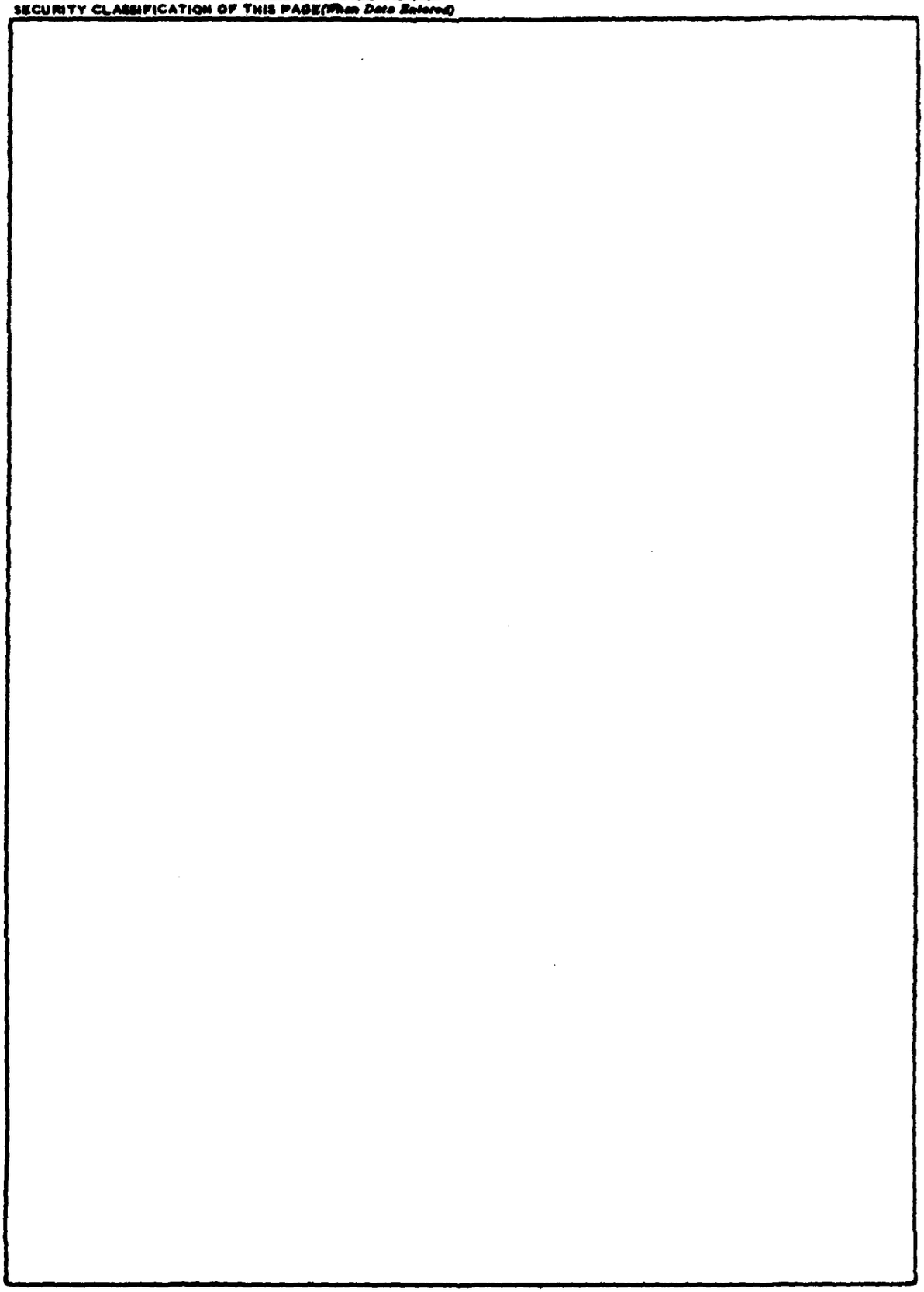

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
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PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Lake Ocquittunk Dam, Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Lake Ocquittunk Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillways are considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

a. Remove the silt from the pond and low-level drain outlet pipe within thirty days from the date of approval of this report.

b. The following remedial actions should be initiated within one year from the date of approval of this report:

(1) Clear the brush and trees from the embankment and the upstream face of the dam as well as the dike.

(2) Monitor the seepage between the spillway and drain outlets.

(3) Fill, grade, and reseed the eroded area at the sides of the low level drain and repair the wave cut bench on the upstream face.

(4) Inspect, repair, and test the valve for the drain.

(5) Inspect and repoint the masonry sidewalls of the drop inlet spillway and channel where necessary.

NAPEN-N
Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

LAKE OCQUITTUNK DAM (NJ00260)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 16 January and 5 February 1981 by Louis Berger and Associates, Inc., under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Lake Ocquittunk Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillways are considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

a. Remove the silt from the pond and low-level drain outlet pipe within thirty days from the date of approval of this report.

b. The following remedial actions should be initiated within one year from the date of approval of this report:

(1) Clear the brush and trees from the embankment and the upstream face of the dam as well as the dike.

(2) Monitor the seepage between the spillway and drain outlets.

(3) Fill, grade, and reseed the eroded area at the sides of the low level drain and repair the wave cut bench on the upstream face.

(4) Inspect, repair, and test the valve for the drain.

(5) Inspect and repoint the masonry sidewalls of the drop inlet spillway and channel where necessary.

APPROVED: Roger L. Baldwin

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE: 22 July 81

D R A F T

DELAWARE RIVER
BASIN

Name of Dam: Lake Ocquittunk
County and State: Sussex, New Jersey
Inventory Number: NJ 00260

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Prepared by: Louis Berger & Associates, Inc.

For: State of New Jersey
Department of Environmental Protection

Date: 22 May 1981

Report Cover Color Code: Yellow

OVERVIEW OF LAKE OCQUITTUNK DAM
MARCH, 1981

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Lake Ocquittunk Dam Fed ID# NJ 00260

State Located	New Jersey
County Located	Sussex
Coordinates	Lat. 4113.6 - Long. 7445.8
Stream	Big Flat Brook
Date of Inspection	January 16 and February 5, 1981

ASSESSMENT OF GENERAL CONDITIONS

Lake Ocquittunk Dam is considered to be in a generally good condition and has a spillway capacity adequate to accommodate the 100-year design flood. It is recommended that the dam be classified as a significant hazard since there are camping areas downstream where a few lives could be lost in the event of a dam failure. No detrimental findings warranting further study were uncovered. Recommended remedial actions to be undertaken in the future include repair of the eroded areas and removal of the vegetation from the embankment, repointing of the masonry spillway and outfall headwall, inspection and repair of the drain's gate valve, and removal of silt from the sedimentation pond and connecting culverts.

Abraham Perera P.E.
Project Manager

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines can be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I investigations is to identify expeditiously those dams that may pose hazards to human life or property. The assessment of the general condition of the dam is based on available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In the review of this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway test flood is based on the estimated "probable maximum flood" for the region (greatest reasonable possible storm runoff) or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: LAKE OCQUITTUNK FED #NJ 00260

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The state, in turn, is under agreement with the U.S. Army Engineer District, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Lake Ocquittunk Dam and appurtenant structures and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Lake Ocquittunk Dam is a 240-foot-long, 3-zone, earth structure with a drop inlet spillway at the right abutment. The embankment, which has a maximum height of 15.1 feet, is 20 feet wide at the crest with 2.5H:1V and 2H:1V slopes upstream and downstream respectively. The upstream portion of the embankment consists of compacted impervious fill. The center of the dam contains a 4-foot-wide impermeable clay core and cutoff trench. The downstream portion of the embankment is composed of ordinary bank run with rock fill at the toe of the slope. The masonry drop inlet structure has a 4 foot by 4 foot opening with flashboards and conducts flow to a 20-inch-diameter C.I. discharge pipe. The outlet headwall is masonry, and the trapezoidal channel is lined with riprap. A 24-inch diameter cast iron drain is located about

50 feet from the right abutment at invert elevation 95.5. The drain has concrete headwalls at both ends, a wheel-operated sluicegate at the entrance, and concrete anti-seep collars at each joint. Skellinger Road extends along the crest of the dam, providing paved protection in that area. The southeast end of Lake Ocquittunk is connected hydraulically to a sedimentation/stabilization pond by 3 pipe culverts under Skellinger Road. The pond is contained by a long, low earth dike whose crest elevation is 110. The dike is an integral hydraulic component of Lake Ocquittunk but has insufficient height or storage capacity to warrant a separate identification number. A 40-foot-wide concrete spillway near the north end of the dike has a crest elevation of 107, which is 0.08 feet higher than the spillway crest elevation at the Lake Ocquittunk Dam. Consequently, the pond and spillway serve to regulate the lake elevation and, in fact, act as a baffle to moderate rapid changes in water levels in Lake Ocquittunk. Inflow to the sedimentation pond (and subsequently Lake Ocquittunk) is augmented by diverting a portion of Big Flat Brook's flow through a concrete channel separation structure on a branch of that stream. The weir conducting flow to the pond is 10 feet long and has a crest elevation of 112.5. The weir returning flow to the channel is 37 feet long and has a crest elevation of 113, thus ensuring that the lake will also be fed even during low stream flow. At the same time, the greater length of the channel weir diverts excessive flows from the lake during periods of very high storm runoff.

b. Location

Lake Ocquittunk Dam, also known as Horseshoe Lake Dam, is situated on a tributary to Big Flat Brook. Skellinger Road extends along the crest of the dam, which is located approximately 700 feet east of the intersection of Skellinger and Flat Brook roads in Stokes State Forest, Sandyston Township, Sussex County, New Jersey.

c. Size Classification

The Lake Ocquittunk Dam has a maximum height of 15.1 feet and a maximum storage capacity of 80.5 acre-feet. Accordingly, this dam is in the small size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage less than 1,000 acre-feet and height less than 40 feet).

d. Hazard Classification

The downstream channel between the dam and Big Flat Brook is undeveloped woodland. However there are several campsites located downstream near Big Flat Brook. Although they are located several feet above the river, it is possible that personal injury and the loss of a few lives could result from a dam failure. Accordingly, it is recommended that the dam be placed in the significant hazard category.

e. Ownership

The dam is owned by the State of New Jersey, Department of Environmental Protection, Bureau of Parks, Trenton, New Jersey.

f. Purpose of Dam

The dam was constructed for recreational purposes.

g. Design and Construction History

The dam was originally designed by the State Department of Conservation and Development, Division of Forests and Parks in 1933 and the plans were revised in 1938. Construction, which was performed by the Civilian Conservation Corps (CCC), began in 1938 and was completed in 1939.

h. Normal Operating Procedures

The dam is maintained and operated by personnel of the State Bureau of Parks. Maintenance crews are available all year for routine repairs and upkeep. The lake is normally lowered every winter for weed control. This winter (1980-1981) the lake was not drawn down due to the drought conditions that existed throughout much of the northern portion of the state. The dam is also monitored by state personnel in the course of their routine duties and during periods of abnormally heavy rainfall and runoff.

1.3 PERTINENT DATA

a. Drainage Area

Lake Ocquittunk Dam has a drainage area of 0.34 square miles that consists of an undeveloped, heavily forested mountainous region.

b. Total spillway capacity (including culverts) at maximum pool elevation - 253 cfs

c. Elevations (Assumed Datum)

Top of dam - 110.6
Principal spillway crest - 106.92
Streambed at centerline of dam - 95.5
Auxiliary spillway crest - 107.0

d. Reservoir

Length of maximum pool (top of dam) - 1,015 feet
Length of recreation pool (principal spillway crest) - 960 feet

e. Storage (acre-feet)

Top of dam - 80.5
Recreation pool - 45.4

f. Reservoir Surface (acres)

Top of dam - 10.8
Recreation pool - 8.5

g. Dam

Type - Earth embankment with masonry drop inlet overflow near right abutment, low-level drain, and concrete auxiliary spillway on hydraulically connected sedimentation pond

Length - 240 feet

Height - 15.1 feet

Top width - 20.0 feet

Side slopes - 2.5H:1V upstream, 2H:1V downstream

Zoning - 3 zones: Fine, impervious compacted material in upstream embankment; impervious clay core; ordinary bank run in downstream embankment

Impervious blanket - None

Core - Impervious clay core 2 feet wide at crest and 4 feet wide at base of dam

Cutoff - 18 inch wide by 4 feet deep concrete cut-off wall contiguous with rock fill at toe of dam

Grout curtain - None

h. Diversion and Regulating Spillway

Type - Concrete weir at elevation 107 in sedimentation pond diverts high flows from Big Flat Brook before they enter Lake Ocquittunk

i. Spillway

Type - Principal - masonry drop inlet with 20-inch-diameter C.I. pipe outlet.
Auxiliary - concrete weir on sedimentation pond.

Weir length - Principal - variable: 4 feet to 7.5 feet
Auxiliary - 40 feet

Gates - None

U/S channel - Lake or pond

D/S channel - Variably sloping, riprapped channel downstream of both spillways

j. Regulating Outlets

The low-level drain consists of a 24-inch-diameter cast iron pipe with 1 foot by 4 foot square concrete collars at each joint. Located near the center of the dam at invert elevation 95.5, the drain has reinforced concrete headwalls at both ends and a CALCO sluicegate at its upstream entrance.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Details of the initial design, hydraulic determinations, structural analyses, and subsurface information were available for review by the inspection team together with as-built plans and the various modifications undertaken since the initial construction. All design was performed by the State Department of Conservation and Development in conjunction with the CCC.

2.2 CONSTRUCTION

The original construction of Lake Ocquittunk Dam was performed by the CCC under the supervision of the State Division of Parks and Forests in 1938/39. Literature investigations indicate that the overburden on which the dam was constructed consists of some stratified glacial sediments, till, and recent alluvium. The depth of the core wall was determined by the subsurface conditions. Although not obvserved during the inspection, bedrock in this area is probably the Silurian High Falls Formation, which consists of alternating beds of hard red sandstone and shale.

2.3 OPERATIONS

General information pertaining to the operations at the dam were obtained from the Superintendent of Stokes State Forest, Department of Environmental Protection, Bureau of Parks, Box 260, Branchville, N.J. 07826. The dam is used for recreational purposes and partial drawdown is effected once a year for maintenance purposes.

2.4 EVALUATION

a. Availability

Sufficient engineering and construction data were available to evaluate the stability and hydraulic capacity of the dam and regulating pond.

b. Adequacy

The field inspection and review of the available design plans reveal that the dam is structurally sound and well built. It is believed that the data available are adequate to render this assessment

and evaluate the hydraulic and hydrologic aspects of the dam within the purview of Public Law 92-367.

c. Validity

The validity of the engineering data available is not challenged and is accepted without recourse to further investigations.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Lake Ocquittunk Dam took place on January 16 and February 5, 1981. Nothing could be seen in January as the dam was completely covered with snow and ice. By February, much of the snow had melted but the lake was still frozen. An ice jam on Big Flat Brook had diverted most of the stream's runoff to the secondary channel that eventually feeds the lake. About 2 feet of water was passing over the canal inlet weir, and a substantial discharge was noted at the auxiliary spillway located on the sedimentation pond. No discharge was observed at the principal spillway on Lake Ocquittunk Dam however, indicating that the hydraulic connection between the two bodies of water is constricted or frozen shut.

b. Dam

The embankment is a straight, relatively low structure lying between higher abutment zones. The road along the crest of the dam has recently been paved and appears to protect the crest from surface runoff and erosion. While the upstream face of the dam had a thick grass cover and one small tree growing on it, the downstream slope was completely overgrown with brush and trees up to 20 inches in diameter. A prior review of this dam by the inspection team revealed that a small wave-cut bench is present on the upstream face but the embankment has stabilized at the water line. Some seepage was noted near the outlet for the low-level drain; however, it appeared to be entering the channel from the direction of the spillway outlet. Since the spillway outlet is 8 feet higher in elevation than the low-level drain, it is likely that the seepage is moving laterally along the toe of the dam rather than through the dam. This assumption is supported by the fact that the dam has an impermeable clay core and cutoff that would severely curtail rapid ground water movement through the dam. Minor erosion was noted on the back slope at the sides of the drain outlet headwall. Although not part of this dam, conditions at the dike were observed. That structure was found to be completely overgrown, making it difficult to discern the outline of the structure.

c. Appurtenant Structures

While the principal outlet headwall is in good condition, the masonry inlet structure is severely weathered. Mortar is missing from between some of the joints and several blocks are missing. The steel trash grate is firmly affixed in place and appears to be functioning adequately. The wheel is missing from the gate stem to the 24-inch-diameter drain and the gangway from the dam to the gate column is also gone. The outlet pipe is partially silted in and a little rusty, while the concrete headwall exhibits minor spalling; however, both appear to be in good condition. The auxiliary spillway at the sedimentation pond also appeared in good condition, although the masonry sidewalls seem to need repointing. The separation wall at the channel separation structure appeared somewhat spalled on the top but otherwise in adequate condition.

d. Reservoir Area

The drainage area of this impoundment is a part of Stokes State Forest and, as such, is undeveloped and protected. The area surrounding the lake is forested and has moderate to steep slopes. According to park personnel, the sedimentation/stabilization pond is almost completely filled with sediment and, if not cleaned out, will soon block the hydraulic connection between the pond and the lake completely. The lake was completely frozen over at the time of the inspection, which prevented observing the problem firsthand. However, since this connection is essential to the proper regulation and protection of the dam, it is essential that the pond be cleaned out as soon as possible.

e. Downstream Channel

Both spillways discharge into masonry-lined trapezoidal channels only a short distance from Big Flat Brook. The area between the dam, dike, and Big Flat Brook is undeveloped and heavily wooded with clear, unobstructed channels to the stream.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Lake Ocquittunk Dam functions essentially unregulated throughout most of the year. Personnel of the State Bureau of Parks, who are responsible for the upkeep and maintenance of the dam, lower the lake every winter to help control weed growth in the lake and minimize ice damage to the dam and facilities at the lake. Park personnel also lower the water level during periods of heavy runoff and inflow to the lake.

4.2 MAINTENANCE OF DAM

The repair and maintenance of the dam is performed by personnel of the State Bureau of Parks. They are responsible for all facets of the dam's upkeep, including the drain and its controls, concrete and masonry repairs, sedimentation control, and landscaping. Park personnel indicate that, at present, the sedimentation pond is almost completely filled with silt. This condition should be corrected since it reduces the hydraulic capacity between the pond and Lake Ocquittunk and minimizes the effective flood storage capacity of the pond. The dam is routinely monitored by maintenance personnel and forest rangers, which facilitates corrective action when deficiencies are noted.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only regulating component at this dam is the 24-inch-diameter C.I. drain. As indicated above, park maintenance personnel are responsible for its maintenance. At the time of the inspection, the wheel was missing from the gate stem; presumably, the park personnel remove the wheel when it is not in use to prevent vandalism.

4.4 DESCRIPTION OF WARNING SYSTEM

The dam is monitored by state maintenance personnel and forest rangers in the course of their routine duties and during periods of abnormally heavy rainfall and runoff, at which time all dams in the State Forest are checked for possible problems. If a potentially hazardous condition is observed at Lake Ocquittunk Dam, the inspecting personnel are instructed to radio a report to headquarters and proceed to the downstream campgrounds to start evacuation procedures.

4.5 EVALUATION

The operational and maintenance procedures in effect at this dam are felt to be adequate within the framework of its limited requirements. The emergency action plans and warning procedures in effect at this dam are considered adequate in view of the undeveloped nature of the downstream area.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Pursuant to the Recommended Guidelines for Safety Inspection of Dams, Lake Ocquittunk Dam is a small size and significant hazard dam. Accordingly, the 100-year frequency storm was chosen as the design flood by the inspecting engineers. Inflow to the reservoir for the design storm was computed utilizing precipitation data from Technical Paper 40 and Technical Memorandum NWS Hydro-35 in conjunction with the HEC-1 DB computer program. The unit hydrograph was derived utilizing Snyder coefficients for the drainage area provided by the Corps of Engineers. Due to the unusual inflow conditions at the lake, runoff to the lake was calculated for the drainage area contributing directly to the lake combined with a portion of the runoff emanating from the Big Flat Brook drainage area upstream of Lake Ocquittunk. The portion of runoff entering the sedimentation pond was calculated to be 5.9% of the total Big Flat Brook runoff on the basis of the weir sizes of the flow separation structure at the inflow canal entrance. On the basis of these criteria, a peak inflow to the lake of 667 cfs was computed; when routed, this amount decreased to a maximum discharge of 251 cfs. Since the dam's combined spillway capacity is 253 cfs, the spillway can accommodate the 100-year flood and is adequate.

b. Experience Data

There are no streamflow records available for this site. The spillway appears to have functioned satisfactorily through the years, and according to park personnel, the dam has never been overtopped.

c. Visual Observation

During the inspection it was noted that the main channel of Big Flat Brook was blocked by a fallen tree and an ice jam that diverted most of the flow to the smaller secondary channel just upstream of the flow separation structure. This hydraulic component appeared to be functioning adequately as designed, and a substantial flow was entering the canal. Water was observed passing over the auxiliary spillway although not at the principal

spillway, suggesting that the hydraulic connection between the pond and the lake was obstructed since the auxiliary spillway weir is 0.08 foot higher in elevation than the principal spillway. The obstruction may be attributed to ice blockage since both lakes and the roadway culvert were completely frozen over. The park rangers were notified of the main channel obstruction following the inspection.

d. Overtopping Potential

Employing the discharge and spillway capacities contained herein, no overtopping would occur during a 100-year frequency storm. There are no records or indications that the dam has ever been overtopped, nor does there appear to be a significant potential for serious damage resulting from overtopping. The roadway pavement appeared to be in good condition and capable of withstanding moderate overtopping without causing erosion and affecting the dam.

e. Drawdown

The 24-inch-diameter C.I. outlet pipe is gate controlled and capable of drawing down the lake to elevation 95.5 in 17.9 hours.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No deficiencies of a structural nature were noted during the inspection of this dam. The horizontal alignment of the dam crest is good, and both upstream and downstream slopes are uniform and appear to be at true design grade. No indication of material movement such as settling, sloughing, or creeping was observed. Water was flowing uniformly over the entire auxiliary weir, indicating the symmetry and continuing stability of that structure.

b. Design and Construction Data

A review of the available design engineering data indicates that the design is well-engineered, reflecting a conservative approach and employing contemporary analytical techniques. Based on the present condition of the dam and a history of uninterrupted satisfactory performance since its construction, it is believed that additional studies or investigations relative to its stability are unnecessary at this time.

c. Operating Records

The performance of this structure has been satisfactory since its completion. However, there are no formal operating records available.

d. Post Construction Changes

There are no records of modifications at this dam, although a wooden walkway that extended from the embankment to the gate wheel is no longer in place. In addition, Skellinger Road, which extends along the crest of the dam, appears to be wider and slightly higher than indicated on the design drawings. The excellent condition of the road indicates that it has recently been repaved. With these exceptions, the dam and its auxiliary hydraulic components appear to be exactly as detailed in the design drawings.

e. Seismic Stability

Lake Ocquittunk Dam is located in Seismic Zone 1, in which seismic activity is slight and the

additional structural loading imparted thereby is generally insignificant. Experience indicates that earthen dams in Zone 1 that are stable under static loading conditions will maintain their structural integrity when subjected to the negligible dynamic loads imposed by the weak seismicity characteristic of this area. As indicated in the foregoing paragraphs, this dam appears to be stable in its present condition and configuration.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ REMEDIAL ACTIONS

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, Lake Ocquittunk Dam is judged to be in a good overall structural condition. The spillway capacity, including the culverts to the stabilization pond, is adequate to accommodate the 100-year frequency design flood. It is recommended that the dam be placed in the significant hazard category since the downstream area contains campgrounds that are utilized extensively for recreation during the spring and summer months.

b. Adequacy of Information

The design information made available by the NJDEP is deemed to be adequate regarding the analyses and evaluation of safe operation and structural stability.

c. Urgency

It is recommended that the remedial measures described in paragraph 7.2 be undertaken in the future, with the exception of cleaning out the pond, which should be undertaken as soon as possible.

d. Necessity for Further Study

In view of the overall condition of this dam, its hydraulic capacity, and the fact that it is continuously monitored and maintained by employees of the state, additional inspections or studies within the purview of Public Law 92-367 are deemed to be unnecessary.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommendations

Under the present maintenance program, it is recommended that the following be performed in the future:

- Clear the brush and trees from the embankment and the upstream face of the dam as well as the dike.

- Fill, grade, and reseed the eroded area at the sides of the low level drain and repair the wave cut bench on the upstream face.

- Inspect and repoint the masonry sidewalls of the drop inlet spillway and channel where necessary.

- Remove the silt from the low-level drain outlet pipe.

- Inspect, repair, and test the valve for the drain.

- Monitor the seepage between the spillway and drain outlets.

b. O&M Procedures

The present maintenance program is considered satisfactory within the limits of the program. However, periodic inspection and repair, of the appurtenant structures described above should be included in the program when necessary. It is recommended that the blow-off valve be opened periodically to ensure its proper functioning and to keep the intake area free of excessive siltation. The existing monitoring and emergency alert plan appears adequate in view of the undeveloped nature of the downstream area.

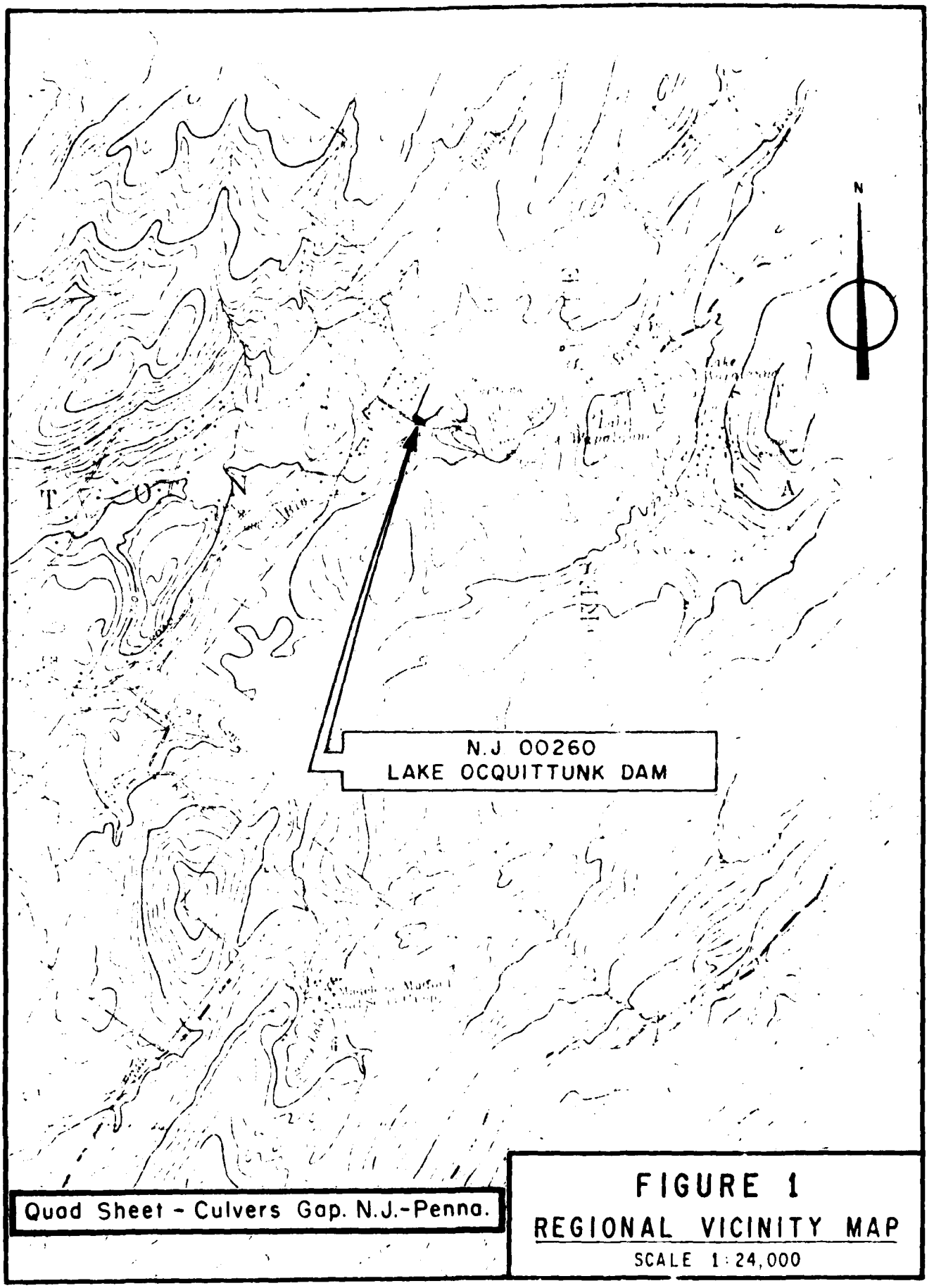
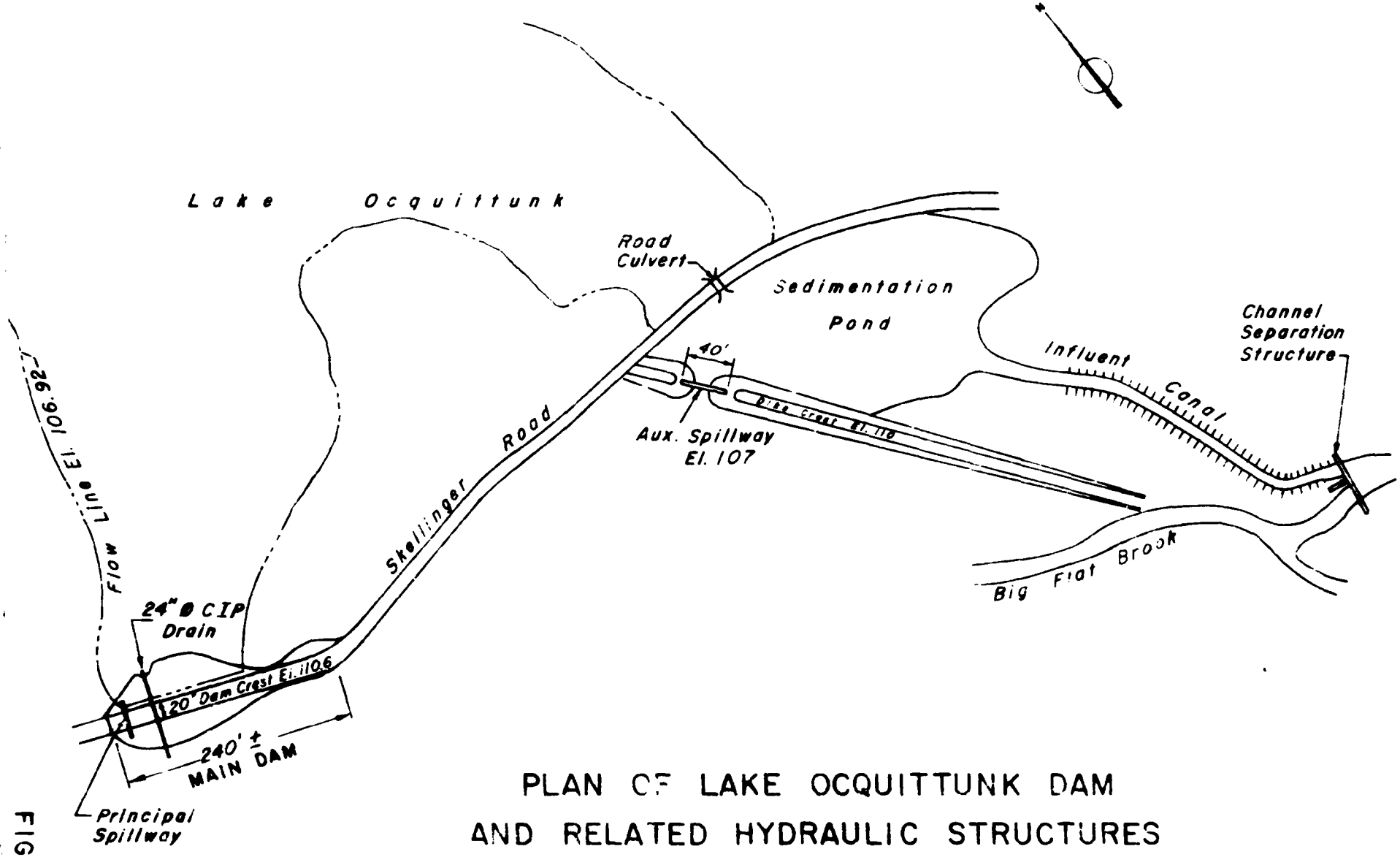


FIGURE 1

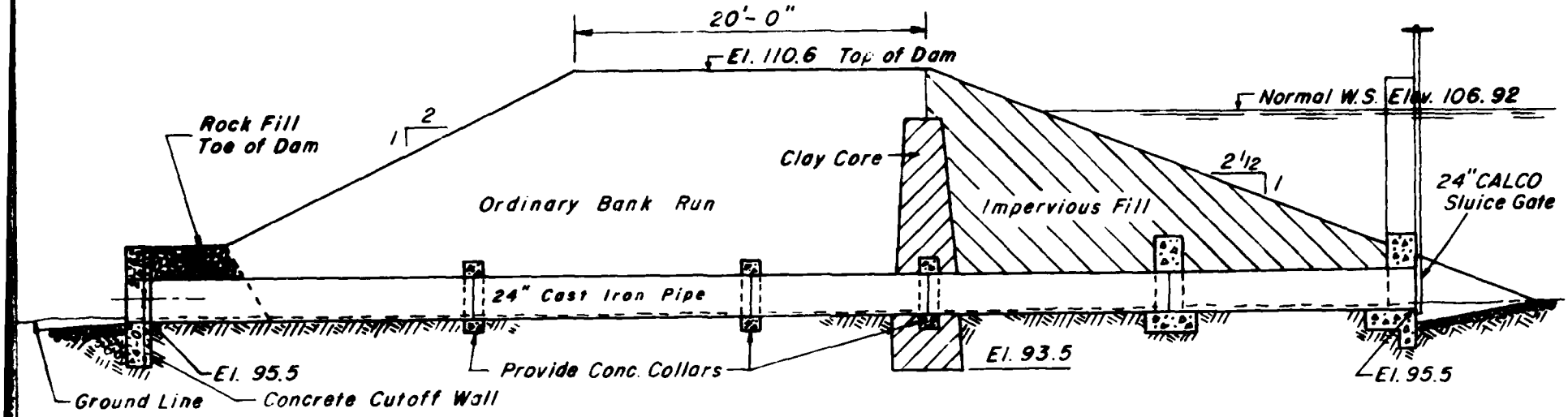
REGIONAL VICINITY MAP

SCALE 1:24,000

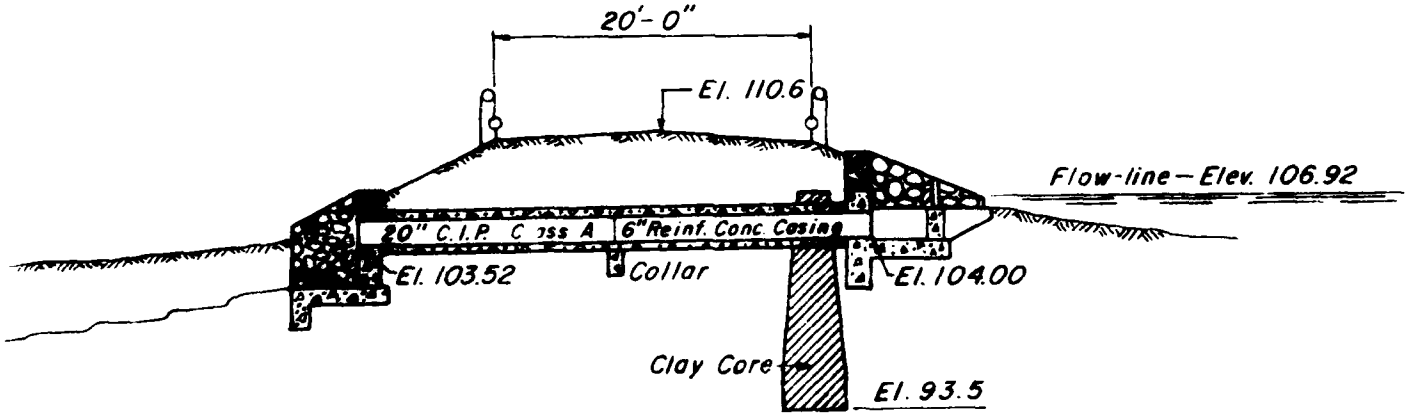


PLAN OF LAKE OCQUITTUNK DAM
AND RELATED HYDRAULIC STRUCTURES

FIGURE 2



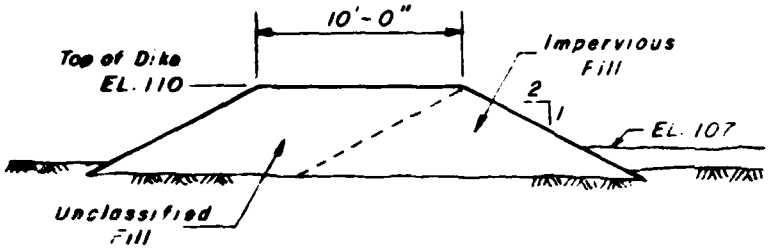
ELEVATIONS – LOW LEVEL DRAIN
NOT TO SCALE



ELEVATIONS – PRINCIPAL SPILLWAY
NOT TO SCALE

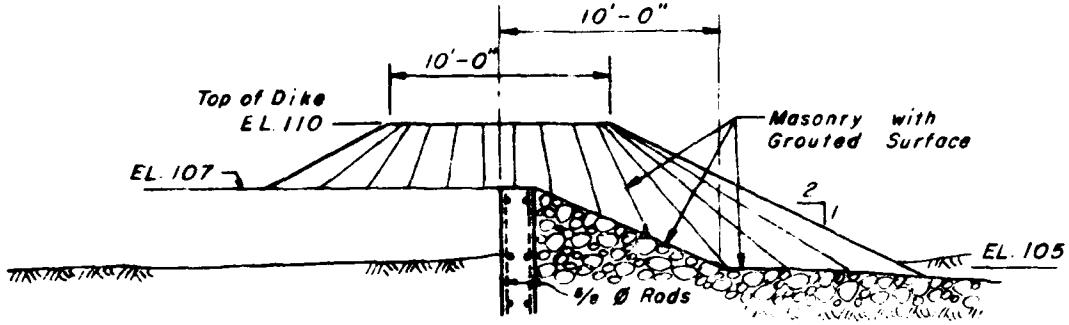
FIGURE 3

LAKE OCQUITTUNK
MAIN DAM



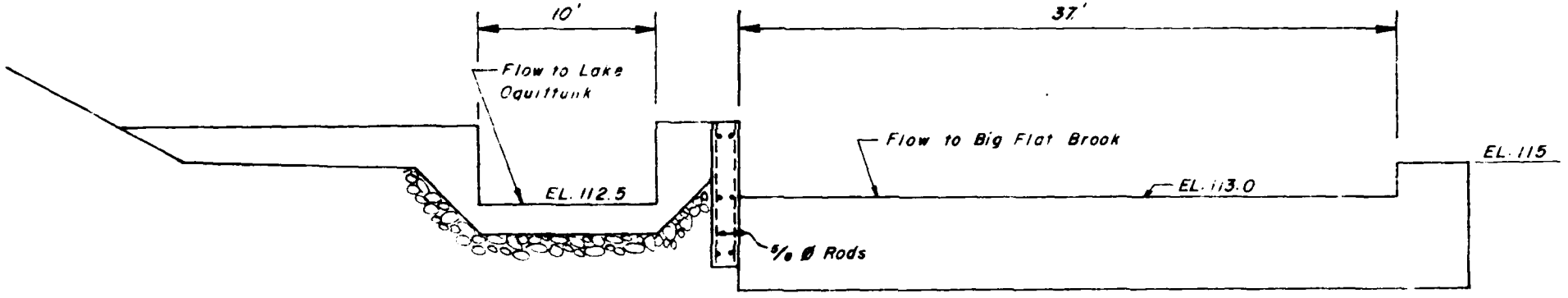
TYPICAL CROSS SECTION OF DIKE

NOT TO SCALE



AUXILIARY SPILLWAY SECTION

NOT TO SCALE



ELEVATION

INFLOW CANAL WEIR

NOT TO SCALE

ELEVATION

STREAM CHANNEL WEIR

NOT TO SCALE

FIGURE 4

CHANNEL SEPARATION STRUCTURE

Check List
Visual Inspection
Phase 1

Name Dam Lake Ocquittunk Dam County Sussex State N.J. Coordinators NJDEP

Date(s) Inspection 1-16-81, 2-5-81 Weather cold and clear Temperature 20°F

Pool Elevation at Time of Inspection 100.9 A.D. Tailwater at Time of Inspection 95.5 A.D.

Inspection Personnel:

J. Ceravolo
T. Chapter
A. Perera
J. Greenstein

No representative of owner present.

T. Chapter Recorder

A.D. - Assumed Datum

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Light erosion next to outlet headwall. Wave cut bench at elevation of normal pool on upstream face.	Eroded areas should be filled. Upstream slope should be protected with riprap in wave action zone.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Both vertical and horizontal alignment is satisfactory. Dam crest paved with 20-foot-wide road.	Pavement protects crest from erosion. Could probably withstand good deal of overtopping with little damage to dam.
RIPRAP FAILURES	No riprap observed.	Riprap should be added to upstream face.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Good grass cover and 1 tree on upstream slope. Downstream slope overgrown with brush and trees up to 20" in diameter. Dike overgrown with trees and brush.	All trees and brush should be removed. Difficult to see shape of dike.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Embankment grades smoothly into both abutments.	
ANY NOTICEABLE SEEPAGE	Seepage to right of drain outlet. Probably comes from spillway outlet 8 feet higher and 35 feet to right of drain.	Dam has clay core and impervious embankment. Seepage appears to travel through stone fill along toe of dam.
STAFF GAGE AND RECORDER	None.	
DRAINS	Stone fill at toe of dam appears to function as drain although not described as such. Seepage through dam should be minimal based on composition.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable. Cast iron pipe slightly rusty.	
INTAKE STRUCTURE	Light spalling on stem column.	Should be patched.
OUTLET STRUCTURE	Light efflorescence noted.	
OUTLET CHANNEL	Stone lined. No obstructions observed.	
EMERGENCY GATE	Wheel missing from gate stem. Appears to be operable since lake was much lower during inventory inspection in 1980.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Auxiliary spillway on sedimentation pond in good condition. Sidewalls need repointing. Some stone missing.	Masonry should be replaced and repointed.
APPROACH CHANNEL	None	
DISCHARGE CHANNEL	Paved masonry apron and riprap channel clear and at true grade.	Several inches of flow discharging smoothly over weir and apron.
BRIDGE AND PIERS	None.	

PRINCIPAL GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Masonry drop inlet in need of repointing. Some stone missing. Flashboards in place at time of inspection. Little or no flow.	Masonry should be replaced and repointed. Water should be flowing unless culvert between pond and lake is blocked.
APPROACH CHANNEL	None.	
DISCHARGE CHANNEL	Riprap-lined channel extends to drain outlet channel and Big Flat Brook. Appears clear.	
BRIDGE AND PIERS	None.	
GATES AND OPERATION EQUIPMENT	Flashboards in satisfactory condition.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate to steep. Undeveloped and heavily wooded. Lake and pond completely frozen. Combination of ice and sedimentation may be preventing flow between lake and sedimentation pond.	Culverts should be checked when ice thaws. Culverts should be cleared if blocked. Unable to observe conditions of culverts at present.
SEDIMENTATION	None observed but park personnel advise pond is almost completely filled with silt. This may be responsible for constriction at connecting culverts. More likely due to ice.	Sedimentation pond should be dredged back to original grades.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Riprap-lined channels from both principal and auxiliary spillway appear clear to Big Flat Brook.	
SLOPES	Channel slopes moderate. Probably designed 2:1. Gradient conforms with terrain.	Channel lengths very short.
APPROXIMATE NO. OF HOMES AND POPULATION	None. Campground near Big Flat Brook about 1,200 feet downstream.	Appears to be above flood elevations.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available. Microfilm - NJDEP, Prospect St., Trenton, N.J.
REGIONAL VICINITY MAP	Available. USGS Quad. Culvers Gap, N.J.-Penna.
CONSTRUCTION HISTORY	No details available.
TYPICAL SECTIONS OF DAM	Available - NJDEP
HYDROLOGIC/HYDRAULIC DATA	Design criteria available - NJDEP
OUTLETS - PLAN	Available - NJDEP
- DETAILS	Available - NJDEP
-CONSTRAINTS	Not Available
-DISCHARGE RATINGS	Not Available
RAINFALL/RESERVOIR RECORDS	Not Available

ITEM	REMARKS
SPILLWAY PLAN	Available - NJDEP
SECTIONS	Available - NJDEP
DETAILS	Available - NJDEP
OPERATING EQUIPMENT	Available - NJDEP
PLANS & DETAILS	Available - NJDEP

ITEM	REMARKS
DESIGN REPORTS	Not Available.
GEOLOGY REPORTS	Not Available.
DESIGN COMPUTATIONS	Not Available.
HYDROLOGY & HYDRAULICS	Not Available.
DAM STABILITY	Not Available.
SEEPAGE STUDIES	Not Available.
MATERIALS INVESTIGATIONS	Not Available.
BORING RECORDS	Not Available.
LABORATORY	Not Available.
FIELD	Not Available.
POST-CONSTRUCTION SURVEYS OF DAM	Not Available.
BORROW SOURCES	Not Available.

ITEM	REMARKS
MONITORING SYSTEMS	None Observed.
MODIFICATIONS	None Noted.
HIGH POOL RECORDS	Not Available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not Available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Not Available.
MAINTENANCE OPERATION RECORDS	Not Available.

February, 1981

Channel Separation Structure

February, 1981

Influent Canal & Sedimentation Pond

February, 1981

Dike Crest and Auxiliary Spillway

February, 1981

Dam Crest and Gate Control Structure

February, 1981

Outlet for Principal Spillway

February, 1981

Outlet Structure 24" Ø C.I. Drain

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.34 sq. m.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 106.92 A.D.* (45.4 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): -

ELEVATION MAXIMUM DESIGN POOL: -

ELEVATION TOP DAM: 110.6 A.D.* (80.5 acre-feet)

CREST: Auxiliary spillway (on dike)

a. Elevation 107
b. Type Concrete weir w/sloping masonry apron
c. Width 12"
d. Length 40'
e. Location Spillover At dike on sedimentation pond
f. Number and Type of Gates None

OUTLET WORKS: Principal spillway (Main Dam)

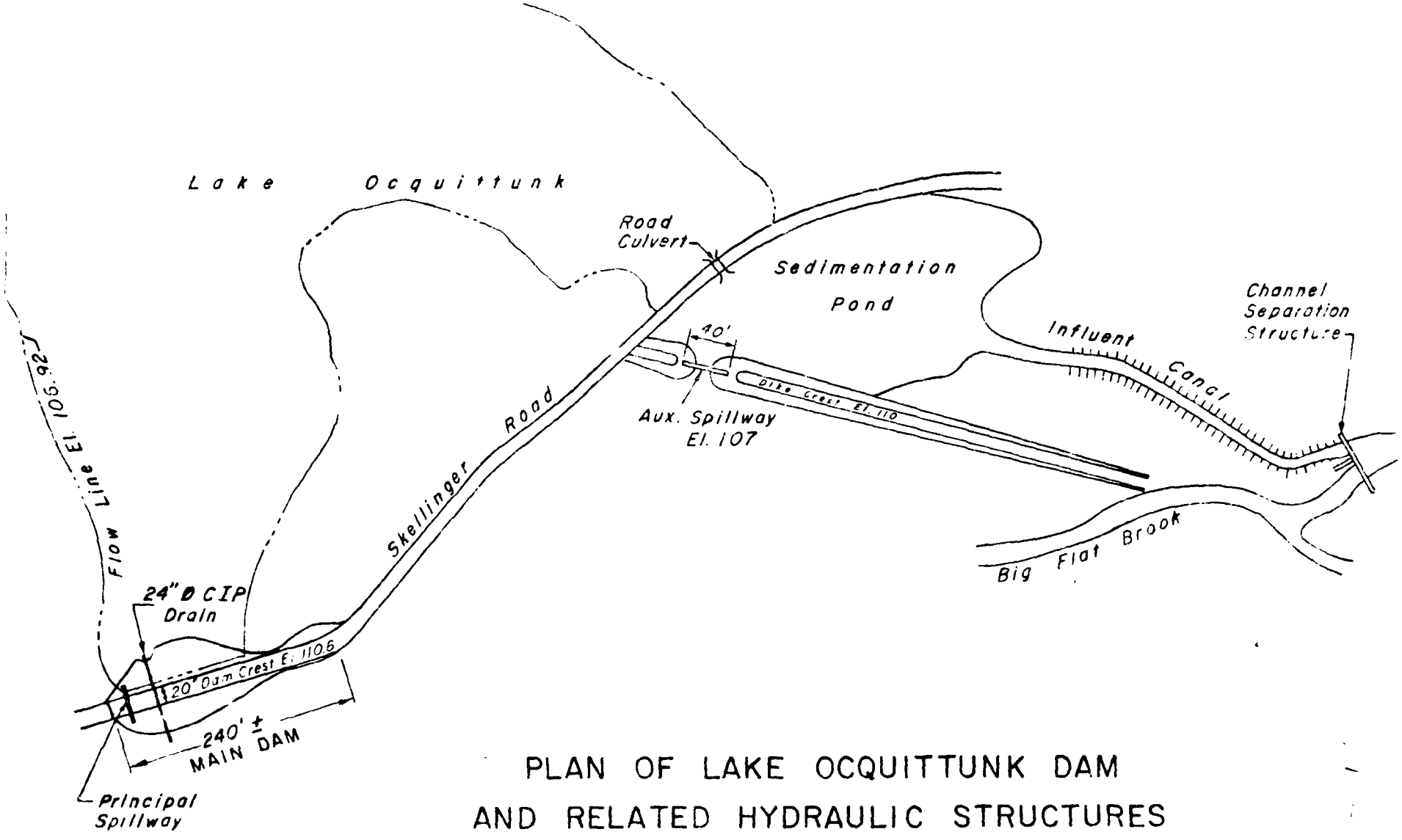
a. Type Masonry drop inlet with 20" C.I. pipe outlet
b. Location Right abutment
c. Entrance inverts 104
d. Exit inverts 103.5
e. Emergency draindown facilities 24" C.I. pipe drain at invert 95.5

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 253 cfs

*A.D. - Assumed Datum



PLAN OF LAKE OCQUITTUNK DAM AND RELATED HYDRAULIC STRUCTURES

BY J. C. ... DATE 3/27/71 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO 42 OF 422

CHKD. BY ..... DATE .... Detention Dam PROJECT ...

SUBJECT ... Flood ... To ... Calculation (Time of Conc.)

Direct inflow from watershed area = DA = .24 sq mi

1. ... Soil Conservation Service Method

a) Length of ... = 1500'

ΔH = 785' − 707' = 78' ; S = 78/1250 = .062 = 6.2%

V = 4.0 fps ; Time = $\frac{1250}{4.0 \times 3600}$ = .09 Hrs

b) Stream flow ... = 4500'

ΔH = 785 − 705 = 80' ; S = 7.0

V = 2 fps ; 3500

Time = 3500/2 ... = .49 Hrs

Σt_c = .49 + .09 = 0.58 Hrs

c) overland flow path only $\frac{\Delta el}{L} = \frac{785 - 707}{5300}$ = 6.1% ; V 2 fps ; $T_c = \frac{5300}{2 \times 3600}$ = .74 Hrs

2. California Culvert Method

a) Stream flow L = 1250' = .24 mi ; H = 78'

$t_c = \left(\frac{11.9 \times L^3}{H}\right)^{.385} = \left[\frac{11.9 \times .24^3}{78}\right]^{.385}$ = .09

b) overland flow = .49 Hrs

Σt_c = .49 + .09 = .58 Hrs

3 SCS METHODOLOGY ... SCS TR #55

Soils Group B

CN = 55

Y = Average Watershed slope = 6.2%

L = 1500 + 3000 = 4500'

S = $\frac{1000}{CN} - 10 = \frac{1000}{55} - 10 = 18.2 - 10 = 8.2$

L = Lag Time = $\frac{L^{.8}(S+1)^{.7}}{1900\, Y^{.5}} = \frac{4500^{.8}(8.2+1)^{.7}}{1900\,(6.5)^{.5}} = \frac{676 \times 4.73}{1900 \times 2.5}$

Lag Time = .63 Hrs.

t_c = L/.6 = 1.38 Hrs.

Avg t_c = 1.38 + .74 + .58 / 3 = 0.90

Avg LAG Time = Tc × .6 = .57 Hr

BY J.C DATE 3/27/81 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO 15 OF 422

CHKD. BY DATE LAKE OCQUITTUNK DAM PROJECT CC276

SUBJECT Test Storm: 100 Year Freq.

FOR LAKE OCQUITTUNK AREA

Precipitation data from TP-40 & NOAA Technical Memorandum NWS Hydro-35

Time	Precip.	Δ	RΔ	Time	Precip.	Δ	RΔ
0.1	.91	.91	.03	3.1	4.30	.05	.91
0.2	1.46	.55	.03	3.2	4.34	.04	.35
0.3	1.81	.35	.03	3.3	4.38	.04	.23
0.4	2.07	.26	.03	3.4	4.41	.03	.17
0.5	2.30	.23	.02	3.5	4.45	.04	.12
0.6	2.46	.16	.03	3.6	4.48	.03	.10
0.7	2.63	.17	.02	3.7	4.52	.04	.09
0.8	2.77	.14	.04	3.8	4.56	.04	.08
0.9	2.89	.12	.03	3.9	4.60	.04	.07
1.0	3.00	.11	.03	4.0	4.63	.03	.06
1.1	3.10	.10	.03	4.1	4.66	.03	.06
1.2	3.20	.10	.04	4.2	4.69	.03	.05
1.3	3.29	.09	.03	4.3	4.72	.03	.05
1.4	3.36	.07	.03	4.4	4.75	.03	.05
1.5	3.44	.08	.04	4.5	4.78	.03	.04
1.6	3.51	.07	.04	4.6	4.82	.04	.05
1.7	3.58	.07	.05	4.7	4.85	.03	.04
1.8	3.65	.07	.05	4.8	4.87	.02	.04
1.9	3.71	.06	.05	4.9	4.90	.03	.04
2.0	3.76	.05	.05	5.0	4.93	.03	.04
2.1	3.81	.05	.05	5.1	4.96	.03	.03
2.2	3.87	.06	.07	5.2	4.98	.02	.03
2.3	3.92	.05	.07	5.3	5.01	.03	.03
2.4	3.97	.05	.07	5.4	5.04	.03	.03
2.5	4.02	.05	.10	5.5	5.06	.02	.03
2.6	4.07	.05	.11	5.6	5.09	.03	.03
2.7	4.12	.05	.14	5.7	5.12	.03	.03
2.8	4.17	.05	.16	5.8	5.15	.03	.02
2.9	4.21	.04	.26	5.9	5.17	.02	.03
3.0	4.25	.04	.55	6.0	5.20	.03	.02

BY J.S. DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

LAKE ACQUITTUNK

FLAT BROOK FLOW

SHEET NO. A4 OF A23

PROJECT 6716

DRAINAGE AREA

1 TOTAL AREA WATERSHED ABOVE CONFLUENCE WITH FLAT BROOK AT POINT BELOW SPLIT INTO ACQUITTUNK CANAL = 15.16 SQ. MI.

2 NORTH AREA DRAINING DIRECTLY INTO LAKE ACQUITTUNK = .54 SQ. MI.

3 APPROXIMATE PERCENT OF DISCHARGE CONTRIBUTING INTO BRANCH FLOWING TO ENTRANCE CANAL TO ACQUITTUNK SEDIMENT POND AFTER SPLIT

20' WIDTH BOTTOM OF BRANCH LEADING TO CANAL

51' WIDTH BOTTOM OF MAIN STREAM

$$\% \text{ DISCHARGE FLOWING IN BRANCH} = \frac{20}{51+20} = 28\%$$

∴ EQUIVALENT AREA CONTRIBUTING TO CANAL FOR USE IN DRAWDOWN CALCULATIONS FOR LOW FLOW

= .28 X 15.16 = 5.0 SQ. MI.

4 APPROXIMATE PERCENT OF TOTAL FLOWING IN ENTRANCE CANAL TO SEDIMENT POND.

PROPORTION OF WIDTHS OF CHANNELS:

$$\frac{\text{CANAL INTO POND}}{\text{CANAL+BRANCH FLAT BROOK}} = \frac{10'}{1037'} = .21 = 21\%$$

% OF TOTAL FLOW OF FLAT BROOK FLOWING INTO ACQUITTUNK SEDIMENTATION POND

$= 6\%_{100} \times .28 \times .21 = .059\ 6\%_{100}$

BY J. Carroll DATE 3/27/81 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO A5 OF A22

CHKD. BY _____ DATE _____ OCQUITTUNK LAKE DAM PROJECT CC 2116

SUBJECT _____ UNIT HYDROGRAPH OF FLAT BROOK

STANDARD FLAT BROOK

SYNTHETIC UNIT HYDROGRAPH

SNYDER COEFFICIENTS GIVEN BY CORPS OF ENGINEERS

$C_t = 2.0$

$C_p = .62$

$L = 52{,}000' = 9.47$ miles

$L_{CA} = 28{,}500' = 5.4$ miles

T_p = Lag Time $= C_t (L L_{ca})^{.3}$

$T_p = 2.0 (9.47 \times 5.4)^{.3}$

$T_p = 2.0 \times 3.26$

$T_p = \underline{6.51 \text{ Hours}}$

where C_t = Coef. representing variation of watershed slope and storage

C_p peaking coef

L = length of the stream in miles

L_{ca} = length along the stream to a point opposite watershed centroid in miles

T_p = Lag time in hrs.

When calculating portion of Flat Brook Flow which enters canal to Ocquittunk Pond (not lake itself but sedimentation pool with its own spillway) use 28% ratio of Total Flat Brook Discharge. This takes 21% of the 28% since the balance of the flow is turning Ocquittunk

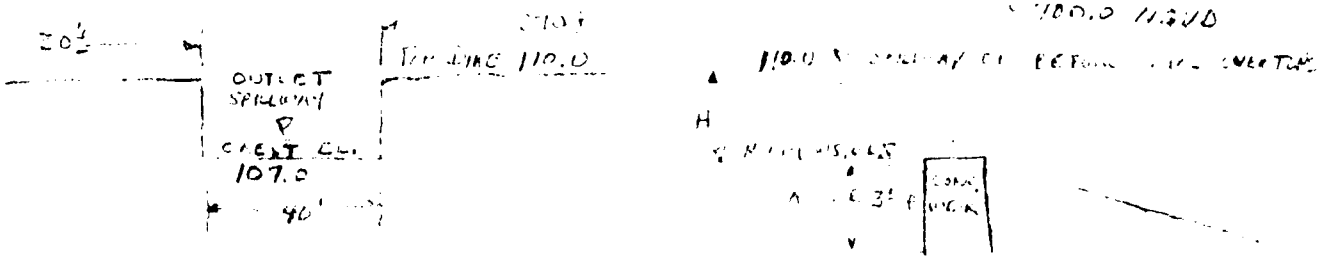
SEDIMENTATION POND $Q_{100} \times .28 \times .21 = .059 Q_{100}$

STABILIZING

BY J.S. DATE 7-21- **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 46 OF A-22

CHKD. BY DATE CHITTENDEN LAKE SEDIMENT PROJECT E-2776

SUBJECT STAGE DISCHARGE OF SPILLWAY & DIKE



ELEVATION VIEW SIDE VIEW

A STAGE DISCHARGE OF SPILLWAY & DIKE

WEIR FLOW: FROM HANDBOOK OF HYDRAULICS PG 5-11 FIG. 5-2

L = 40' RECTANGULAR, SHARP CRESTED WEIR

$\frac{H}{P}$ VS. C CURVES ∴ FIND C FROM FIG 5-2 (APPROACH VELOCITY CORRECTED)

L = 420' DIKE OVERTOPPING FLOW ∴ C = BROAD CRESTED WEIR

$Q = C L H^{3/2}$

	SPILLWAY FLOW			DIKE OVERTOPPING			TOTAL
ELEV.	H	C	Q	H	C	Q	Q
107.0	0	–	0				0
107.5	.5	3.2	45				45
108.0	1	3.3	132				132
108.5	1.5	3.4	250				250
109.0	2	3.45	390				390
109.5	2.5	3.6	569				569
110.0	3	3.65	759				759
110.5	3.5	3.7	969	.5	2.6	386	1355
111.0	4.0	3.82	1222	1.0	2.7	1134	2355
111.5	4.5	3.85	1470	1.5	2.7	2065	3535

BY J.S. DATE	**LOUIS BERGER & ASSOCIATES INC.**	SHEET NO. 7 OF [illegible]
CHKD. BY ______ DATE ______	LA. [illegible]	PROJECT [illegible]
SUBJECT ______	STAGE DISCHARGE	

ESTIMATING ΔH FOR ORIFICE FLOW THROUGH 3 - 36" CMP CONNECTING LAKE [illegible] TO SEDIMENTATION / STABILIZING POND. FROM THE HEC 1 HYDROGRAPH FOR [illegible] AREA ([illegible] OCCUPATION [illegible] FLAT [illegible] POND DETERMINE THE [illegible] WATER SURFACE ELEV. OF EACH POND.

TIME	W.S. ELEV FROM HEC 1 [illegible] FOR LAKE AREA	W.S. ELEV FROM HEC 1 RUN FOR FLAT [illegible]	ΔH
1 HR	10[illegible]	10[illegible]	—
2	106.1	10[illegible]	—
	10[illegible].5		[illegible]5
3	10[illegible]	101.1	[illegible]7
	1[illegible]1.0		1[illegible]
	11[illegible]		
4	111.[illegible]	10[illegible]	[illegible]

BY J.C. DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

SHEET NO A 8 OF A 22

PROJECT

STAGE DISCHARGE

FOR INLET SEDIMENTATION POND

STAGE DISCHARGE OF CULVERT FROM LAKE SCHUYLKILL

TO SEDIMENTATION POND

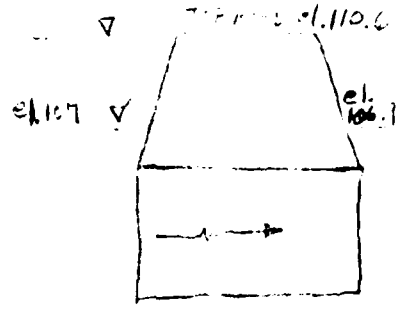
CONDITIONS:

TOP OF ROAD el. 110.6

EL. 109.28 MAX WATER EL

el. 109 MIN WATER EL

el. 103.0



A = π(1.5)² × 3 = 21.2 ft²

USE CALCULATION FOR THE DISCHARGE = MAXIMUM WATER HEAD.

Pg. 4-39 TABLE 4-11

L = 25' DIA = 3' C.M.P. n=.024

C = .71

CALCULATIONS WITH PLOTTING WATER DEPTH PLOTTING POINTS

el.	ΔH	C	Q (3'-36" CMP)
107	0	.71	0
108	1	.71	3 × 54 = 162
109	1.5	.71	3 × 54 = 162
110	2.4	.71	3 × 61 = 183
111	3.5		4 × 56.5 = 226
107.5	.5		3 × 28 = 85
108.5	1.4		3 × 42 = 126
110.6	3.2		3 × 57 = 171

EL	ΔH	C	Q
111.5	3.5	.71	4 × 56.5 = 226

BY J.C DATE 3/27/81
CHKD. BY ____ DATE ____
SUBJECT ____

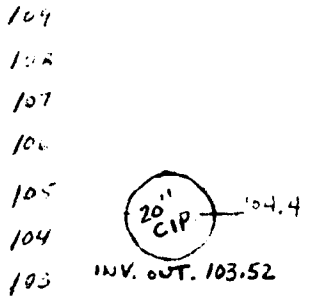
LOUIS BERGER & ASSOCIATES INC.

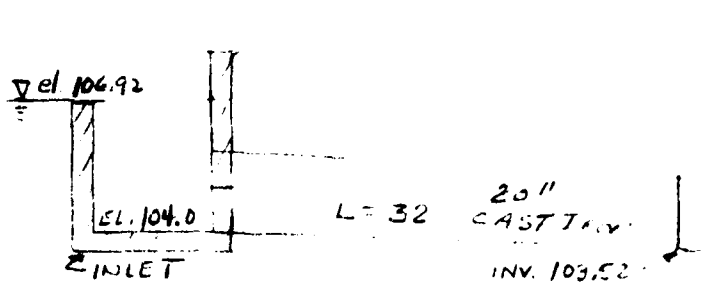
LAKE OCQUITTUNK DAM
STAGE DISCHARGE

SHEET NO 49 OF 122
PROJECT 5-276

FIND GOVERNING CONDITION OF FLOW: PIPE FLOW OR INLET BOX

EL. 110.6 TOP DAM





BY J.C. DATE 3/27/91 — LOUIS BERGER & ASSOCIATES INC. — SHEET NO. A10 OF A22

CHKD BY ____ DATE ____ — LAND DEVELOPMENT DIVISION — PROJECT ____

SUBJECT STORM DRAINAGE (CONT'D.)

1. PIPE FLOW (CULVERT)

$Q = C A \sqrt{2g \Delta H}$

$n = 2.19^{C_1}$

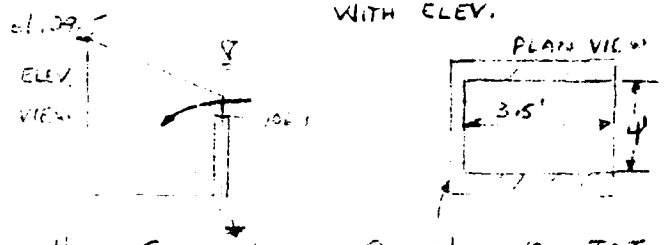
SOURCE: HANDBOOK OF HYDRAULICS TABLE 4-11 P 4-37 FOR 'C'

ΔH = el WS - WS el OUT - 1.4 H

2. INLET FLOW (WEIR)

$Q = CL H^{3/2}$

LENGTH OF WEIR VARIES WITH ELEV.



3. FLOW OVER DAM

$Q = CL H^{3/2}$

$L = 240'$

$C = 2.7$

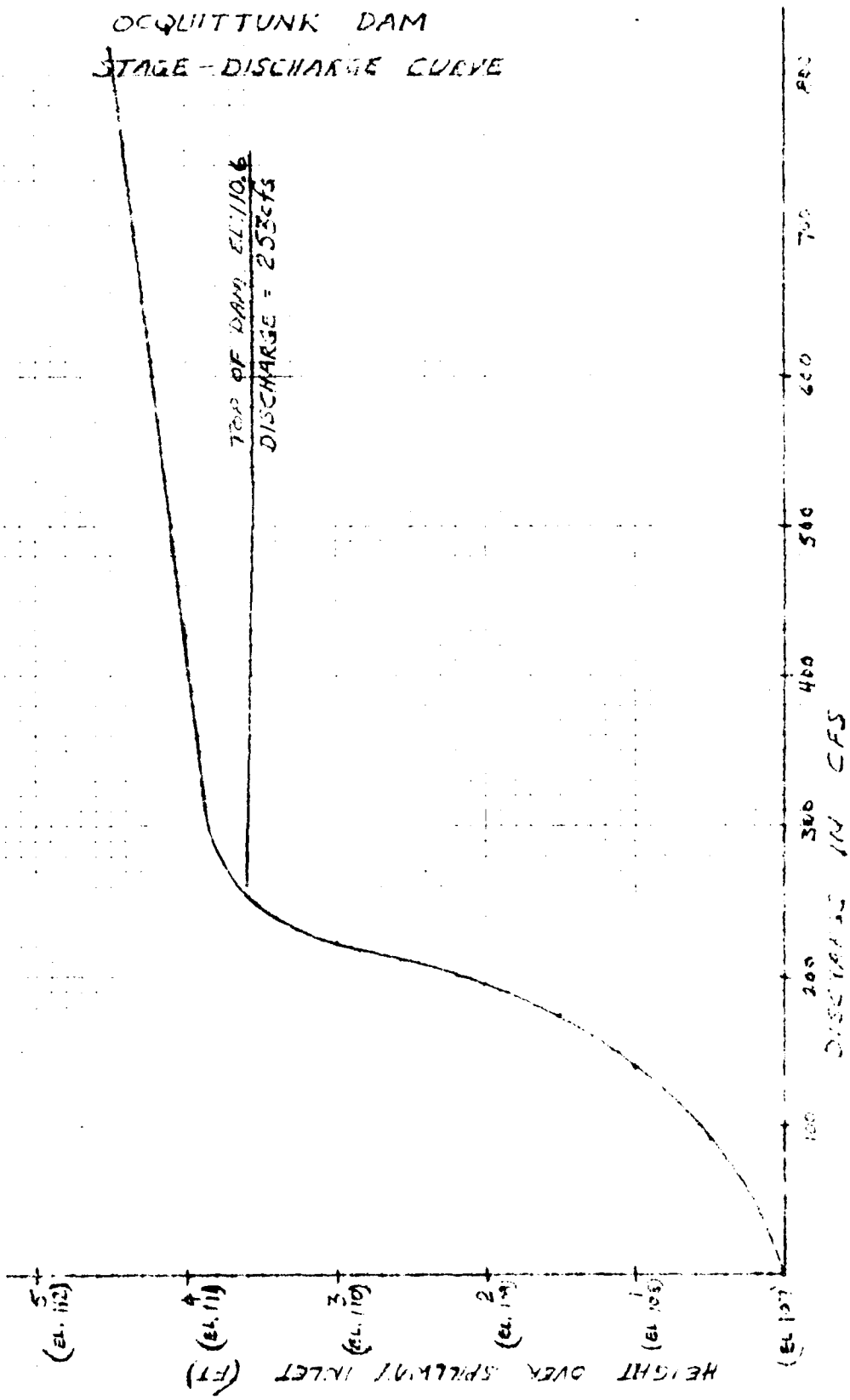
4. FLOW INTO SEDIM. POND

TOTAL Q

EL.	ΔH	C	Q	H	C	L	Q	H OVER BACK WEIR	Q	TOT Q	ΔH	Q		TOTAL Q
106.92	2.52	.84	~~25~~	—									0	0
107.0	2.6	"	~~24~~	.08	3.2	4	13						0	13
107.5	3.1	"	~~27~~	.58	3.2	4	61						55	91
108.0	3.6	"	~~28~~	1.08	3.2	4.9	19						0	133
108.5	4.1	"	30	1.58	3.4	5.25	~~35~~	PIPE FLOW GOVERNS					43	173
109.0	4.6	"	32	2.08	3.45	6.12	~~68~~	↓					162	194
109.5	5.1	"	33	2.58	3.6	7.05	~~105~~							
110.0	5.6	"	35	3.08	3.65	7.5	148	.5	5	~~153~~			164	221
110.5	6.1	"	36	3.58	3.7	7.5	188	1.0	13	~~201~~				
110.6	6.2	"	36.5	3.68	3.7	7.5	196	1.1	15	~~211~~			216	253
111.0	6.6	"	38	4.08	3.8	7.5	235	1.5	25	260	.4	164	226	428
111.5	7.1	"	39	4.58	3.9	7.5	287	2.0	39	~~326~~	.9	553	226	818

* CENTER OF SLOPE TO BE TAKEN AS ½ THE LENGTH.

OCQUITTUNK DAM
STAGE - DISCHARGE CURVE



BY J[illegible] DATE [illegible]

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A 12 OF 22

PROJECT [illegible]

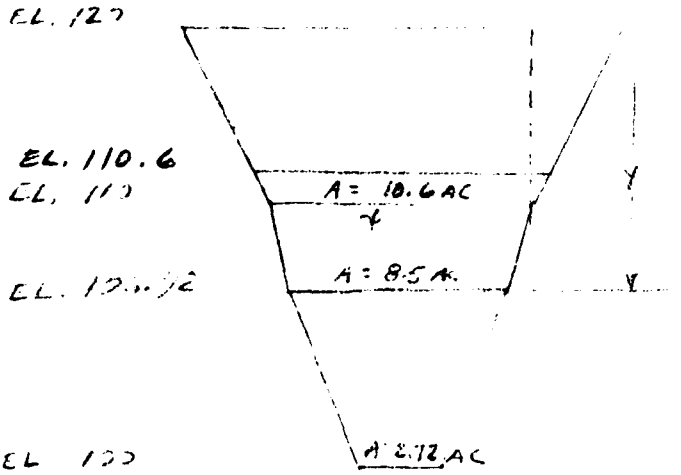
[illegible] STORAGE

AREA LAKE AT ELE. 106.12 = 8.5 AC. MEAN. [illegible]

AREA LAKE AT ELEV. 110.0 = 10.6 AC. " " "

AREA LAKE AT ELEV 120.0 = 17 AC MEAN [illegible]

Δ STORAGE = $Y(X + \Delta X)$



BETWEEN 106.12 & 110

$\frac{10.6 - 8.5}{3.88} = \frac{2.1}{3.88} = .7$ AC/FT.

$\Delta Y = .7/2 = .35$

BETWEEN 110 & 120

$\frac{17 - 10.6}{10} = \frac{6.4}{10} = .64$ AC/FT

$\Delta Y = .64/2 = .32$ AC

ELEV.	HT. ABOVE SPILLWAY (FT.)	$(Y + \Delta Y)$ AC.	SURFACE AREA AC)	INCREMENTAL STORAGE (AC FT.)	TOTAL INCREMENTAL STORAGE (AC-FT.)	TOTAL STORAGE (AC-FT)
95.5			0			—
100			2.72			6.12
107	.08		8.5	0.7 NEGLIG.	0.7 NEGLIG.	45.39
109	1	8.85	9.2	8.85	8.85	54.24
109	2	1.3	99	18.4	18.4	6379
110	3	9.55	10.6	28.65	28.65	74.05
110.6	3.6 (.6)	10.79		6.45	35.10	80.50

* [illegible]

BY J.C. DATE 7/11/11 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO A 13 OF A 22

CHKD. BY ____ DATE ____ LAKE EQUINUNK PROJECT 5476

SUBJECT DRAWDOWN TIME OF LAKE

1. DRAWDOWN OUT OF MAIN LAKE BY 24" CMP
   NORMAL POOL ELEV. = 106.92 SAY 107 MSL
   INLET & EXIT ELEVATION = 95.50
   VOLUME OF STORAGE ↓ MEASURED FROM EXIST. DRAINING CONTOURS
   = 15.4 AC.FT.

2. DRAWDOWN OUT OF ENTRANCE POND
   NORMAL POOL ELEV. = 107
   EL CULV UNDER RD. 102.5
   VOLUME STORAGE ↓ MEASURED FROM EXIST DRAINING CONTOURS
   AREA @ EL 107 = .93 AC
   AREA @ EL 102.5 = 0
   VOLUME = 1.89 AC.FT

   TOTAL VOLUME = [illegible]

3. INFLOW FROM DRAINAGE AREA
   ASSUME 1 cfs/s.m.
   FROM PAGE A4:
   TOTAL AREA CONTRIB. TO LAKE EQUINUNK = 5.08 sm + .34 sm
   = 5.42 SM FOR 100 yr.

   ∴ INFLOW = 5.42 cfs

4. DRAWDOWN FLOW OUT OF LAKE
   EL. 110.6

   ▽ WS EL. 107 CREST OF POOL

1 24" CMP L = 74' [illegible] L 26.5

$Q = CA\sqrt{2g\Delta H}$ $A_{24"} = 3.14^{01}$

FIND C FROM HANDBOOK OF HYDRAULICS, HAND. TABLE 4-11 P4-37 (1 = CMP CULV.

BY JC DATE 3/27/01 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO A 14 OF A-2

CHKD. BY _____ DATE _____ PROJECT _____

SUBJECT LAKE [illegible] DRAWDOWN TIME (cont'd)

C = .73 ΔH FROM CREST POOL TO ℄ PIPE = 10.5'

DRAWDOWN BETWEEN EL 107 & 97.5 T.O. PIPE

MAX Q = .73 × 3.14 $\sqrt{2g(10.5)}$ = 59.6 cfs ∴ 1 PIPE

5

DRAWDOWN TIME

EL.	STORAGE AC.FT.	FLOW cfs	AVG FLOW cfs	INFLOW	AVG. FLOW OUT	TIME
107		59.6				
	39.7		47 cfs	− 5.42	= 41.58	1.6 HRS
100		34.4				
	6.1		17.2	− 5.42	= 11.78	6.3 HRS
95.5		0				

TOTAL TIME 17.9 HOURS

$\frac{39.7 \times 43560}{41.58 \times 3600} + \frac{6.1 \times 43560}{11.78 \times 3600} =$ 17.9 HRS

BY ..... DATE 7/2/81 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO A 15 OF A22

CHKD. BY ..... DATE ..... PROJECT .....

SUBJECT ..... HEC-1 DB FOR LAKE ALMA

```
A1  LAKE OCQUITTUNK
A2  J. CERAVOLO
A3  MARCH 30, 1981
B    100       0       6       0       0       0       0       0       0       0
B1     3
K      0       1                                       1
K1  INFLOW HYDROGRAPH TO RESERVOIR
M      0       2      34
Q     60
Q1   .03     .03     .03     .03     .02     .03     .02     .04     .03     .03
Q1   .03     .04     .03     .03     .04     .04     .05     .05     .07     .05
Q1   .05     .07     .07     .09     .10     .11     .13     .16     .21     .15
Q1   .91     .35     .23     .17     .12     .10     .09     .08     .07     .06
Q1   .05     .05     .05     .05     .04     .04     .04     .04     .04     .04
Q1   .03     .03     .03     .03     .03     .03     .03     .03     .03     .03
T                                                       1       1
W2          .570
X      0       0       1
K      1       2                                       1
K1  ROUTED FLOWS THROUGH RESERVOIR
Y                                       1       1
Y1     1                                                        -1
Y4  106.9   107.5   108.5     109     110   110.6     111
Y5     0      91     173     194     221     253     428
$A   8.5    10.6      17
$E 106.9     110     110
$$ 106.9
$D 110.6
K     99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
RUNOFF HYDROGRAPH AT 1
ROUTE HYDROGRAPH TO 2
END OF NETWORK

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	6	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			3	0	0	0			

INFLOW HYDROGRAPH TO RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	1	1	1	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISAME	LOCAL
0	2	0.34	0.00	0.00	0.00	0.000	0	0

PRECIP PATTERN

0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.04	0.03	0.03
0.03	0.04	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.05
0.05	0.07	0.07	0.09	0.10	0.11	0.13	0.16	0.21	0.15
0.91	0.35	0.23	0.17	0.12	0.10	0.09	0.08	0.07	0.06
0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOR	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.50	0.10	0.00	0.00

UNIT HYDROGRAPH DATA

BY J.C DATE 7/2/91 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO A 16 OF A 22

CHKD. BY ____ DATE ____ LAKE [illegible] DAM PROJECT [illegible]

SUBJECT [illegible] POST DEVELOPED AREA

SUB-AREA RUNOFF COMPUTATION

PRECIP DATA

NP	STORM	DAJ	DAK
60	0.00	0.00	0.00

TC= 0.00 LAG= 0.57

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 30 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 0.57 VOL= 1.00

19.	57.	118.	194.	247.	264.	258.	230.	192.	145.
108.	83.	69.	50.	38.	29.	23.	17.	13.	10.
8.	6.	5.	4.	3.	2.	2.	1.	1.	0.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
**********	**********	**********	**********	**********

HYDROGRAPH ROUTING

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0	-

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
**********	**********	**********	**********	**********

PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
**********	**********	**********	**********	**********

BY JLC DATE 7/24/01

CHKD. BY ____ DATE ____

SUBJECT ____ HEC-1 DL FOR LAKE AKOA

LOUIS BERGER & ASSOCIATES INC.

LAKE [illegible] DAM

SHEET NO A17 OF A42

PROJECT CS 236

END-OF-PERIOD FLOW

MO	DA	HR	MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	END-OF-PERIOD FLOW COMP Q	Q	DA	HR	MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1	01	0	06	1	0.03	0.00	0.03	107		0	1	01	5	06	51	0.03	0.02	107
		0	12	2	0.03	0.00	0.03	93		0	1	01	5	12	52	0.03	0.02	93
		0	18	3	0.03	0.00	0.03	83		0	1	01	5	18	53	0.03	0.01	83
		0	24	4	0.03	0.00	0.03	75		0	1	01	5	24	54	0.03	0.02	75
		0	30	5	0.02	0.00	0.02	68		0	1	01	5	30	55	0.03	0.01	68
		0	36	6	0.03	0.00	0.03	63		0	1	01	5	36	56	0.03	0.02	63
		0	42	7	0.02	0.00	0.02	58		0	1	01	5	42	57	0.03	0.01	58
		0	48	8	0.04	0.00	0.04	54		0	1	01	5	48	58	0.02	0.01	54
		0	54	9	0.03	0.00	0.03	50		0	1	01	5	54	59	0.02	0.01	50
		1	00	10	0.03	0.00	0.03	47		0	1	01	6	00	60	0.02	0.02	47
		1	06	11	0.03	0.00	0.03	43		0	1	01	6	06	61	0.00	0.00	43
		1	12	12	0.04	0.00	0.04	39		0	1	01	6	12	62	0.00	0.00	39
		1	18	13	0.03	0.00	0.03	35		0	1	01	6	18	63	0.00	0.00	35
		1	24	14	0.03	0.00	0.04	32		0	1	01	6	24	64	0.00	0.00	32
		1	30	15	0.04	0.00	0.04	29		0	1	01	6	30	65	0.00	0.00	29
		1	36	16	0.04	0.00	0.04	26		0	1	01	6	36	66	0.00	0.00	26
		1	42	17	0.05	0.01	0.04	24		1	1	01	6	42	67	0.00	0.00	24
		1	48	18	0.05	0.01	0.04	22		3	1	01	6	48	68	0.00	0.00	22
		1	54	19	0.05	0.01	0.04	20		8	1	01	6	54	69	0.00	0.00	20
		2	00	20	0.05	0.01	0.04	18		15	1	01	7	00	70	0.00	0.00	18
		2	06	21	0.05	0.01	0.04	17		25	1	01	7	06	71	0.00	0.00	17
		2	12	22	0.07	0.01	0.06	15		36	1	01	7	12	72	0.00	0.00	15
		2	18	23	0.07	0.01	0.06	14		49	1	01	7	18	73	0.00	0.00	14
		2	24	24	0.07	0.02	0.05	13		57	1	01	7	24	74	0.00	0.00	13
		2	30	25	0.07	0.02	0.05	12		72	1	01	7	30	75	0.00	0.00	12
		2	36	26	0.08	0.02	0.06	11		84	1	01	7	36	76	0.00	0.00	11
		2	42	27	0.10	0.03	0.07	10		94	1	01	7	42	77	0.00	0.00	10
		2	48	28	0.11	0.03	0.08	9		116	1	01	7	48	78	0.00	0.00	9
		2	54	29	0.14	0.04	0.09	8		139	1	01	7	54	79	0.00	0.00	8
		3	00	30	0.16	0.05	0.11	7		175	1	01	8	00	80	0.00	0.00	7
		3	06	31	0.24	0.08	0.16	6		235	1	01	8	06	81	0.00	0.00	6
		3	12	32	0.55	0.20	0.35	5		326	1	01	8	12	82	0.00	0.00	5
		3	18	33	0.91	0.34	0.57	4		438	1	01	8	18	83	0.00	0.00	4
		3	24	34	0.23	0.42	0.81	3		552	1	01	8	24	84	0.00	0.00	3
		3	30	35	0.17	0.16	0.01	2		633	1	01	8	30	85	0.00	0.00	2
		3	36	36	0.12	0.11	0.01	1		667	1	01	8	36	86	0.00	0.00	1
		3	42	37	0.09	0.08	0.01	1		659	1	01	8	42	87	0.00	0.00	1
		3	48	38	0.08	0.07	0.01	1		616	1	01	8	48	88	0.00	0.00	1
		3	54	39	0.07	0.06	0.01	1		550	1	01	8	54	89	0.00	0.00	1
		4	00	40	0.06	0.05	0.01	1		473	1	01	9	00	90	0.00	0.00	1
		4	06	41	0.06	0.05	0.01	1		404	1	01	9	06	91	0.00	0.00	1
		4	12	42	0.05	0.04	0.01	1		345	1	01	9	12	92	0.00	0.00	1
		4	18	43	0.05	0.04	0.01	1		297	1	01	9	18	93	0.00	0.00	1
		4	24	44	0.05	0.04	0.01	1		255	1	01	9	24	94	0.00	0.00	1
		4	30	45	0.04	0.03	0.01	1		220	1	01	9	30	95	0.00	0.00	1
		4	36	46	0.03	0.04	0.01	1		192	1	01	9	36	96	0.00	0.00	1
		4	42	47	0.03	0.03	0.01	1		168	1	01	9	42	97	0.00	0.00	1
		4	48	48	0.04	0.03	0.01	1		148	1	01	9	48	98	0.00	0.00	1
		4	54	49	0.04	0.03	0.01	1		132	1	01	9	54	99	0.00	0.00	1
		5	00	50	0.04	0.03	0.01	1		118	1	01	10	00	100	0.00	0.00	1

				SUM
CFS	657.	156.	93	53
CMS	19.	4	3	2
INCHES		4.26	4.26	4.26
MM		108.15	108.20	108.20
AC-FT		77	77	77
THOUS CU M		95	95	95

				SUM
				9342
				259
				4.26
				108.20
				77
				95

BY ... DATE ...
CHKD. BY ... DATE ...
SUBJECT ...

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 41 OF 42
PROJECT ...

ROUTED FLOWS THROUGH RESERVOIR

ISTAG	ICOMP	IECON	ITAPE	JAIT	JPRT	IWID	ITAT	IAUTO
2	1	0	7	0	0	1	0	0

ROUTING DATA

GLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

STAGE	106.90	107.50	108.50	109.00	110.00	110.60	111.10
FLOW	0.00	91.00	173.00	194.00	221.00	251.00	478.00
SURFACE AREA=	9.	11.	17.				
CAPACITY=	0	30.	168.				
ELEVATION=	107.	110.	120.				

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
106.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
110.6	0.0	0.0	0

END-OF-PERIOD HYDROGRAPH ORDINATES

MO	DA	HR	MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1	01	0	06	2	0.10	0	0	0	106.9
1	01	0	12	3	0.20	0	0	0	106.9
1	01	0	18	4	0.30	0	0	0	106.9
1	01	0	24	5	0.40	0	0	0	106.9
1	01	0	30	6	0.50	0	0	0	106.9
1	01	0	36	7	0.60	0	0	0	106.9
1	01	0	42	8	0.70	0	0	0	106.9
1	01	0	48	9	0.80	0	0	0	106.9
1	01	0	54	10	0.90	0	0	0	106.9
1	01	1	00	11	1.00	0	0	0	106.9
1	01	1	06	12	1.10	0	0	0	106.9
1	01	1	12	13	1.20	0	0	0	106.9
1	01	1	18	14	1.30	0	0	0	106.9
1	01	1	24	15	1.40	0	0	0	106.9
1	01	1	30	16	1.50	0	0	0	106.9
1	01	1	36	17	1.60	0	0	0	106.9
1	01	1	42	18	1.70	1	0	0	106.9
1	01	1	48	19	1.80	3	0	0	106.9
1	01	1	54	20	1.90	6	1	0	106.9
1	01	2	00	21	2.00	16	2	0	106.9
1	01	2	06	22	2.10	33	5	0	107.0
1	01	2	12	23	2.20	36	8	0	107.0
1	01	2	18	24	2.30	46	13	1	107.0
1	01	2	24	25	2.40	59	19	1	107.0
1	01	2	30	26	2.50	71	25	1	107.1
1	01	2	36	27	2.60	84	32	2	107.1
1	01	2	42	28	2.70	98	40	2	107.2
1	01	2	48	29	2.80	116	49	3	107.2
1	01	2	54	30	2.90	137	60	3	107.3
1	01	3	00	31	3.00	155	73	4	107.4
1	01	3	06	32	3.10	206	90	5	107.5
1	01	3	12	33	3.20	306	104	7	107.7
1	01	3	18	34	3.30	450	141	9	107.9
1	01	3	24	35	3.40	552	151	12	108.2
1	01	3	30	36	3.50	603	177	15	108.6
1	01	3	36	37	3.60	657	194	19	109.0
1	01	3	42	38	3.70	659	204	23	109.4
1	01	3	48	39	3.80	616	213	27	109.7
1	01	3	54	40	3.90	550	221	30	110.0
1	01	4	00	41	4.00	478	223	32	110.2
1	01	4	06	42	4.10	404	221	34	110.4
1	01	4	12	43	4.20	345	214	35	110.5
1	01	4	18	44	4.30	297	200	35	110.5
1	01	4	24	45	4.40	255	181	36	110.6
1	01	4	30	46	4.50	220	160	35	110.5
1	01	4	36	47	4.60	191	140	35	110.5
1	01	4	42	48	4.70	168	122	34	110.5
1	01	4	48	49	4.80	148	106	33	110.4
1	01	4	54	50	4.90	130	93	32	110.4
1	01	5	00	51	5.00	115	82	31	110.3
1	01	5	06	52	5.10	102	72	30	110.3
1	01	5	12	53	5.20	90	64	29	110.2

1.01	5.18	53	5.30	89	[illegible]	29	[illegible]
1.01	5.24	54	5.40	82	217	[illegible]	[illegible] 8
1.01	5.30	55	5.50	75	214	27	109.7
1.01	5.36	56	5.60	68	211	26	109.6
1.01	5.42	57	5.70	63	208	24	109.5
1.01	5.48	58	5.80	58	205	23	109.4
1.01	5.54	59	5.90	54	201	22	109.3
1.01	6.00	60	6.00	50.	198	21	109.2
1.01	6.06	61	6.10	47	195	20	109.0
1.01	6.12	62	6.20	43	190	18	108.9
1.01	6.18	63	6.30	39	185.	17	108.3
1.01	6.24	64	6.40	33	180	16	108.7
1.01	6.30	65	6.50	28	174	15	108.5
1.01	6.36	66	6.60	22	165	14	108.4
1.01	6.42	67	6.70	16	155	12	108.3
1.01	6.48	68	6.80	14	14[illegible]	11	108.2
1.01	6.54	69	6.90	11	13[illegible]	10	108.1
1.01	7.00	70	7.00	8	127	9	107.9
1.01	7.06	71	7.10	6	119	8	107.8
1.01	7.12	72	7.20	5	110	7	107.7
1.01	7.18	73	7.30	4	103	6	107.5
1.01	7.24	74	7.40	3	95	6	107.6
1.01	7.30	75	7.50	2.	87	5	107.5
1.01	7.36	76	7.60	2	7[illegible]	4	107.4
1.01	7.42	77	7.70	1	66	4	107.3
1.01	7.48	78	7.80	1	57	3	107.3
1.01	7.54	79	7.90	1	5[illegible]	3	107.2
1.01	8.00	80	8.00	1	45	2	107.2
1.01	8.06	81	8.10	0	[illegible]	2	107.1
1.01	8.12	82	8.20	0	32	2	107.1
1.01	8.18	83	8.30	0	28	[illegible]	107.1
1.01	8.24	84	8.40	0	24	1	[illegible]
1.01	8.30	85	8.50	0	21	1	107.0
1.01	8.36	86	8.60	[illegible]	18	1	107.0
1.01	8.42	87	8.70	0	15	1	107.0
1.01	8.48	88	8.80	0	13	1	107.0
1.01	8.54	89	8.90	0	12	1	107.0
1.01	9.00	90	9.00	0	[illegible]	1	107.0
1.01	9.06	91	9.10	0	9	0	[illegible]
1.01	9.12	92	9.20	0	7	0	[illegible]
1.01	9.18	93	9.30	0	6.	0	[illegible]
1.01	9.24	94	9.40	0.	6	0	[illegible]
1.01	9.30	95	9.50	0	5	0	[illegible]
1.01	9.36	96	9.60	0	4	0	[illegible]
1.01	9.42	97	9.70	0	4	0	[illegible]
1.01	9.48	98	9.80	0	3	0	106.9
1.01	9.54	99	9.90	[illegible]	3	0	[illegible]
1.01	10.00	100	10.00	0	2	0	[illegible]

PEAK OUTFLOW IS 251. AT TIME 4.40 HOURS

CFS	251.	152.	93.	93.	9329
CMS	7.	4.	3.	3	264
INCHES		4.17	4.25	4.25	4.25
MM		105.87	108.05	108.05	108.05
AC-FT		76	77.	77	77
THOUS CU M		93.	95	95	95

RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

HYDROGRAPH AT	1	667.	156	93	93	0.34
		(18.88)(	4.41)(	2.65)(	2.65)(	0.88)
ROUTED TO	2	251.	152.	93	93	0.34
		(7.10)(	4.31)(	2.64)(	2.64)(	0.88)

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	106.90	106.90	110.60
STORAGE	0	0	36
OUTFLOW	0.	0	253

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	110.56	0.00	36	251	0.00	4.40	0.00

BY J.C. DATE 7/2/91 **LOUIS BERGER & ASSOCIATES INC.**

CHKD. BY DATE PROJECT

SUBJECT

```
A1  LAKE GEORGE FLAT BROOK
A2  J.CERAVOLO
A3  MARCH 26, 1991
B     200       0      15       0       0       0       0       0       0
E1      5
J       1       1       1
J1    005
K       0       3
K1  INFLOW HYD FROM FLAT BROOK
M       0       1    18.5               18.5
O      24
O1   .06     .07     .07     .08     .09     .10     .11     .13     .15     .19
O1   .30     .64    1.66     .40     .25     .16     .14     .12     .10     .09
O1   .08     .08     .07     .06
T                                                       .5      .1
W    6.51    62
X       0       0       1
Y       1       4                                       .4
K1  ROUTED FLOW THROUGH ENTRANCE POND
Y                               1       1
Y1      1                                              -1
Y4    707   707.5     708   708.5     709   709.5     710   710.5     711
Y5      0      45     130     250     390     569     759    1295    2155
E6      1     1.5
E6    707     712
E1    707
E2    710
K      99
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JOB SPECIFICATION

IX	NHR	NMIN	IDAY	IHR	[illegible]	METRIC	[illegible]	[illegible]	ISTAN
200	0	15	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

INFLOW HYD FROM FLAT BROOK

	ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	3	0	0		0	0	0	0	0

ROUTING DATA

	IHYDG	LUNG	TAREA	SNAP	TSDAT	[illegible]	RATIO	ISAME	LSAME	[illegible]
	0	1	18.50	0.00	18.50	0.00	0.000	0	0	

PRECIP PATTERN

0.05	0.07	0.07	0.08	0.09	0.10	0.11	0.13	0.15	0.1
0.30	0.64	1.66	0.40	0.25	0.16	0.14	0.12	0.10	0.0
0.08	0.08	0.07	0.06						

LOSS RATE

ERUPT	SIPER	DLTRR	RTIO	ERAIN	STRK	RTIOR	STRKR	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.50	0.10	.00	0.00

[illegible] CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP AT 10**25.03 AND R=4.53 INTERVALS

HYDROGRAPH ROUTING

N	NPS	NPTS	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0	0.000	0.000	0.000	0	-1

YEAR	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME

BY ..... DATE 7/1/81

CHKD. BY ..... DATE .....

SUBJECT HEC1 DB

LOUIS BERGER & ASSOCIATES INC.

LAKE [illegible] DAM

FLAT BROOK UNIT HYDROGRAPH

SHEET NO 21 OF A-22

PROJECT [illegible]

SUB-AREA RUNOFF COMPUTATION

PRECIP DATA

NP	STORM	DAJ	DAK
24	0.00	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 6.51 CP=0.62 NTA= 0

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES. LAG= 6.48 HOURS. CP= 0.62 VOL= 0.97

9	34.	71.	115.	165.	219.	277.	338.	402.	[illegible]
535.	604.	674.	746.	816.	882.	941.	994.	1041.	1081.
1115.	1143.	1164.	1178.	1186.	1188.	1177.	1156.	1124.	1078.
1032.	990.	951.	913.	876.	841.	808.	775.	[illegible]	715.
687.	659.	632.	607.	583.	560.	537.	515.	494.	[illegible]
455.	436.	421.	404.	388.	372.	357.	343.	[illegible]	[illegible]
304.	291.	280.	269.	259.	248.	238.	[illegible]	[illegible]	[illegible]
203.	194.	186.	179.	172.	165.	159.	[illegible]	[illegible]	[illegible]
134.	129.	124.	119.	114.	110.	106.	101.	[illegible]	[illegible]
89.	86.	82.	79.	[illegible]	73.	70.	[illegible]	[illegible]	[illegible]

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME			
0.	0	0	0	0	0	1	1
4.	8	14	23.	33.	43.	56.	69.
114.	130.	144.	158.	169.	180.	195.	211.
261.	270.	277.	283.	287.	289.	289.	[illegible]
268.	259.	251.	243.	233.	223.	213.	[illegible]
184.	177.	170.	163.	156.	150.	144.	[illegible]
122.	118.	113.	108.	104.	100.	96.	[illegible]
81.	78.	75.	72.	69.	66.	64.	[illegible]
54.	52.	50.	48.	46.	44.	42.	[illegible]
36.	35.	33.	32.	31.	29.	28.	[illegible]
24.	23.	22.	21.	20.	19.	18.	17.
11.	5.	4.	[illegible]	[illegible]	2.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.

BY [illegible] DATE [illegible] **LOUIS BERGER & ASSOCIATES INC.** SHEET [illegible] OF [illegible]

CHKD. BY _____ DATE _____ [illegible] PROJECT [illegible]

SUBJECT HECLOP FLAT BROOK [illegible]

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATION
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

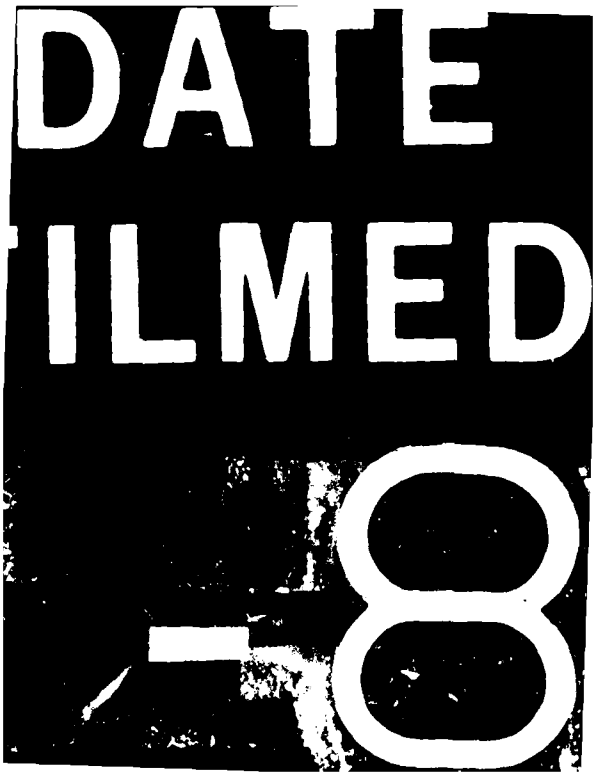
RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO 1
				0.66
HYDROGRAPH AT	3	18.50	1	280.
		(47.91)		(8.180)
ROUTED TO	4	18.50	1	280.
		(47.91)		(8.180)

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	707.00	707.00	710.00
STORAGE	0.	0.	3.
OUTFLOW	0.	0.	759.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	DURATION OVER TOP HOURS	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.66	709.64	3.00	2.	209.	2.00	3.50	0.00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